



Practical Use of Meteorological Models and Visualization Tools for Soaring Forecasts

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- * Retired NWS Meteorologist 42 years*
- * Manager / CWSU Aviation Support*
- * Contest Forecaster – Discus 2A: 4000 hours*
- * Barron Hilton Cup – West U.S. Winner 2008*
- * WGC Uvalde 2012 Technical Support Met*

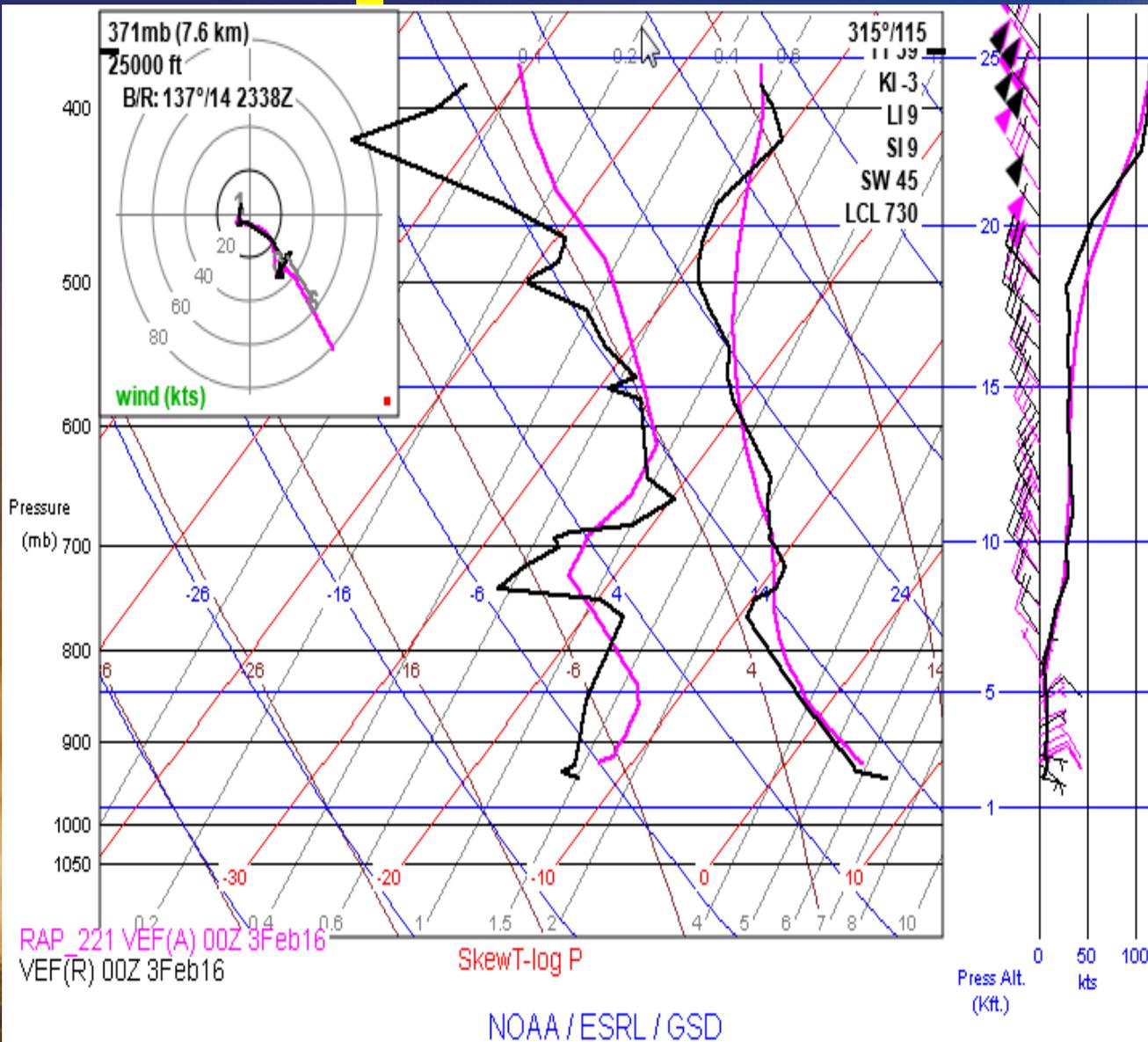




What We Will Talk About Today...

- Atmospheric Soundings for Soaring – How to Visualize Thermal Layer (PBL)
 - Radiosonde Balloons; Profilers & Aircraft
 - Numerical Models and Forecast Soundings
- Software Tools For Soundings – How To ...
 - What About DrJack.net and XCSkies.com?
 - ESRL SKEW-T, BUFKIT and RAOB.com
- Where Is U.S. NOAA Numerical Modeling Efforts Headed?
- What About Weather in the Cockpit?

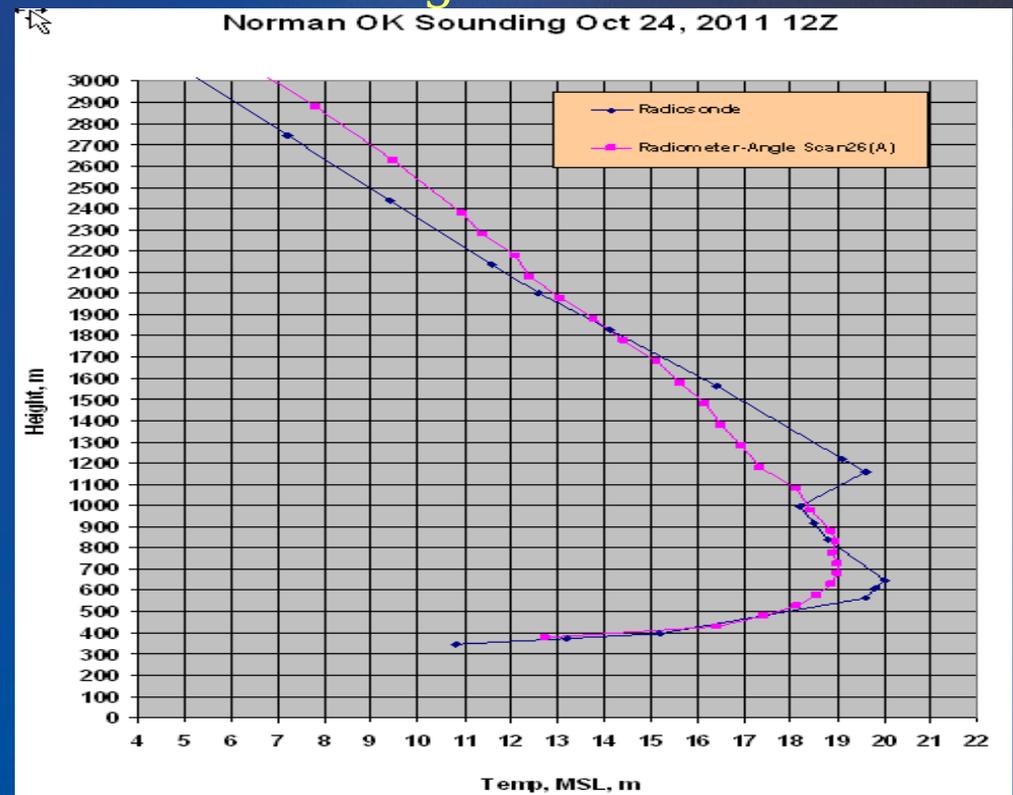
Typical Radiosonde Ob Compared to Model Sounding



- Black - Las Vegas Raob
- Temp DewPt
- Valid 4pm PST
- Sharp boundaries at top Thermal Layer
- Purple - Model RAP Sounding
- Notice smoothing of features

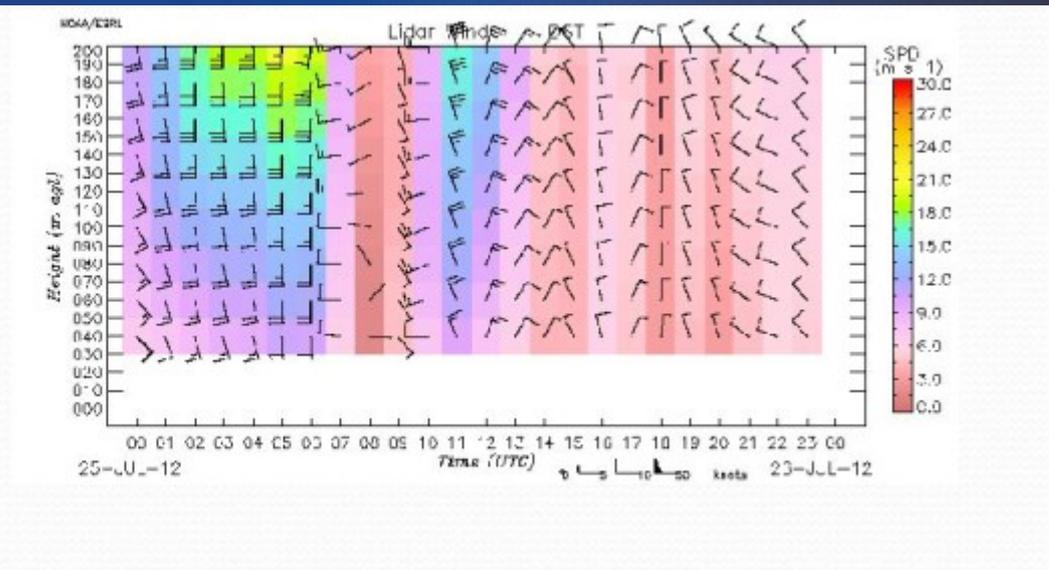
Observing Thermal Layer - Remote Soundings

- Radiometers - Detects temperature moisture profiles; No Wind info. Accuracy depends on nearby sounding and historical statistical data
- Radiometric.com is a leaders in the field. There are now over 300 of their MP-300 instruments around world. Far less expensive to operate than Radiosondes. One of founders is Mike Exner - long time Boulder Soaring Assoc member



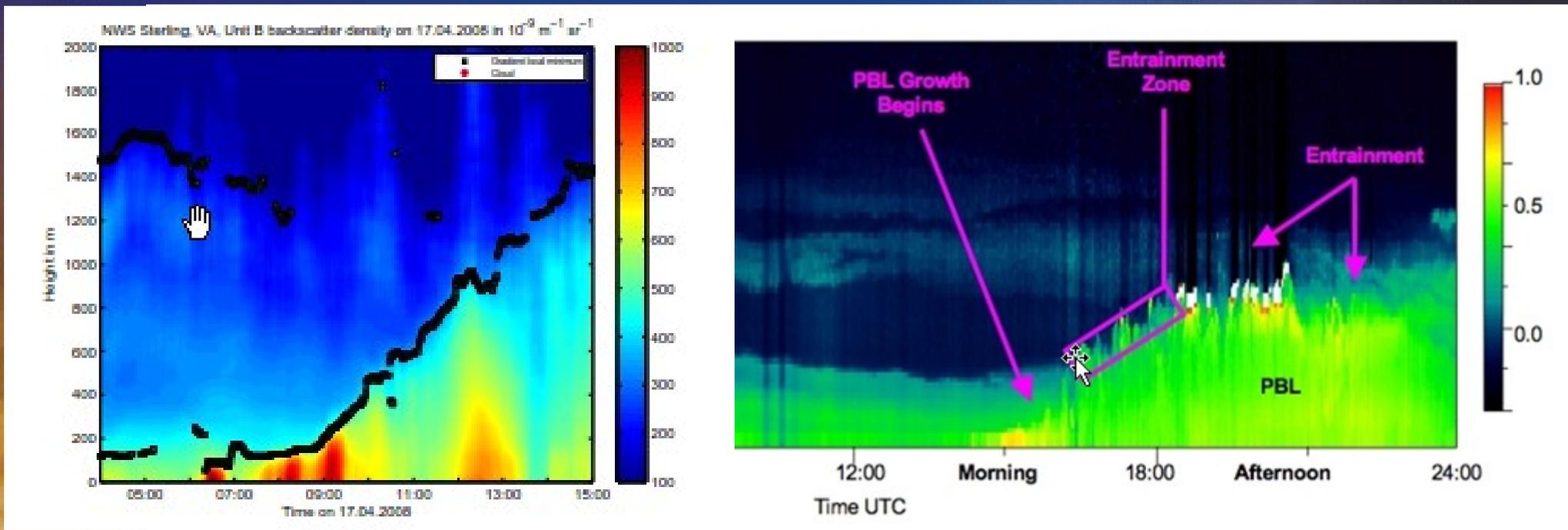
Observing Thermal Layer – Remote Soundings

- Radar Wind Profiler/RASS – Delivers wind temp profiles except in extremely clear air



Observing Thermal Layer – Remote Soundings

- Lidar Profiler/Ceilometer – Used in NWS ASOS can detect thermal layers – But... not operationally available





Observing Thermal Layer – Remote Soundings

- In Short... Remote Soundings are NOT PRACTICAL because of cost or operational status for soaring forecasts
- Sometimes... like WGS-2012 Uvalde... one is able to get access to these systems. Radiometrics provided one of their radiometers during the World Soaring Championships

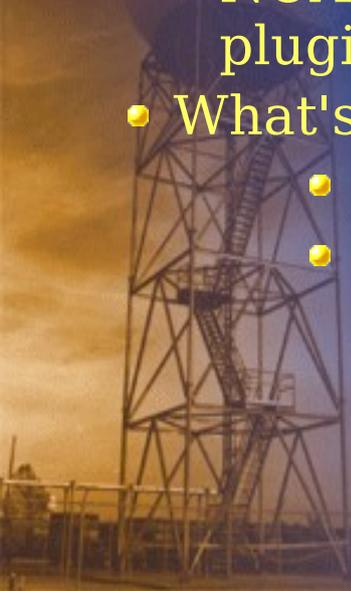
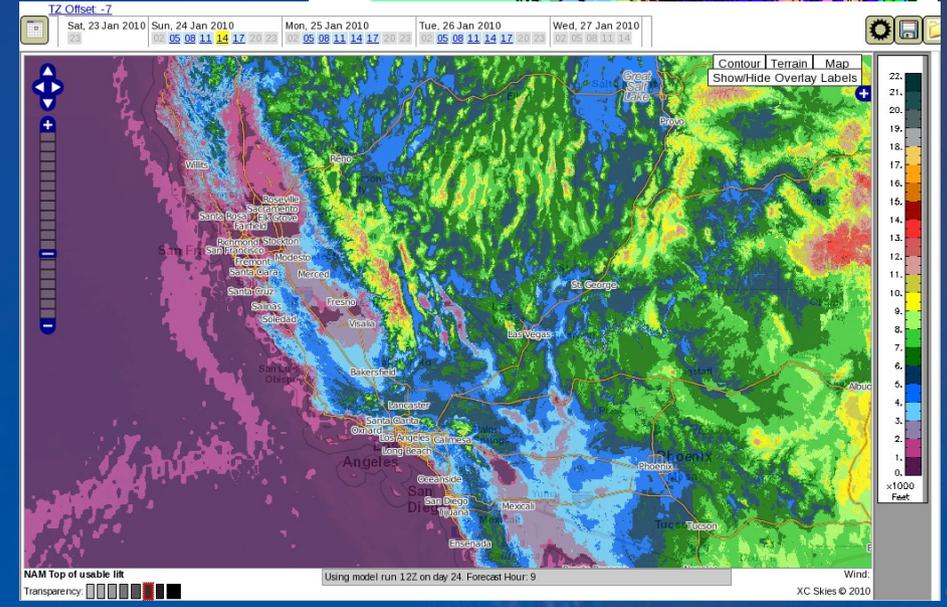
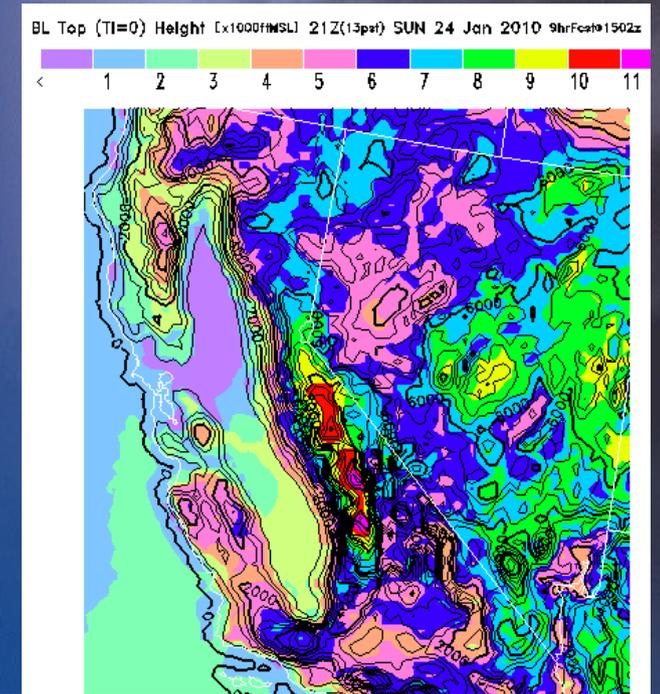




Software Tools For Soundings

What About *DrJack.net* and *XCSkies*?

- Both still provide **solid value** and are more than sufficient for 1-3 day flight planning
- DrJack BLIMAP - Stable; No Development; only Maintenance
- XCSkies - Unchanged since around 2009; Stable and valuable resource
- Both sites no longer display radiosonde obs or Interactive NOAA Skew-T through the java plugin
- What's the future?
 - Good Question? ...
 - RAP, HRRR, NAM and GFS Gridded Formats may change in 2019... as NOAA converts to "Ensembles" of 20 runs





Software Tools For Soundings

Numerical Model Forecasts

- Models have complex simulation of surface energy budgets and physics of the atmosphere boundary layer
- Vertical number of layers is sufficient to resolve evolution of the PBL (thermal layer)... and performance of the physical simulation keeps improving
- In the U.S. ... Gridded Data at 3km to 13km resolution and Binary Model Soundings for hundreds of locations are freely available
- Currently ... as of early 2016... HRRR (3km) runs hourly to 15hrs; NAM (13km) 6hourly to 84hrs; NAM4km (4km) 6hourly to 60 hrs.

So.... What's needed are visualization tools for accessing these soundings!



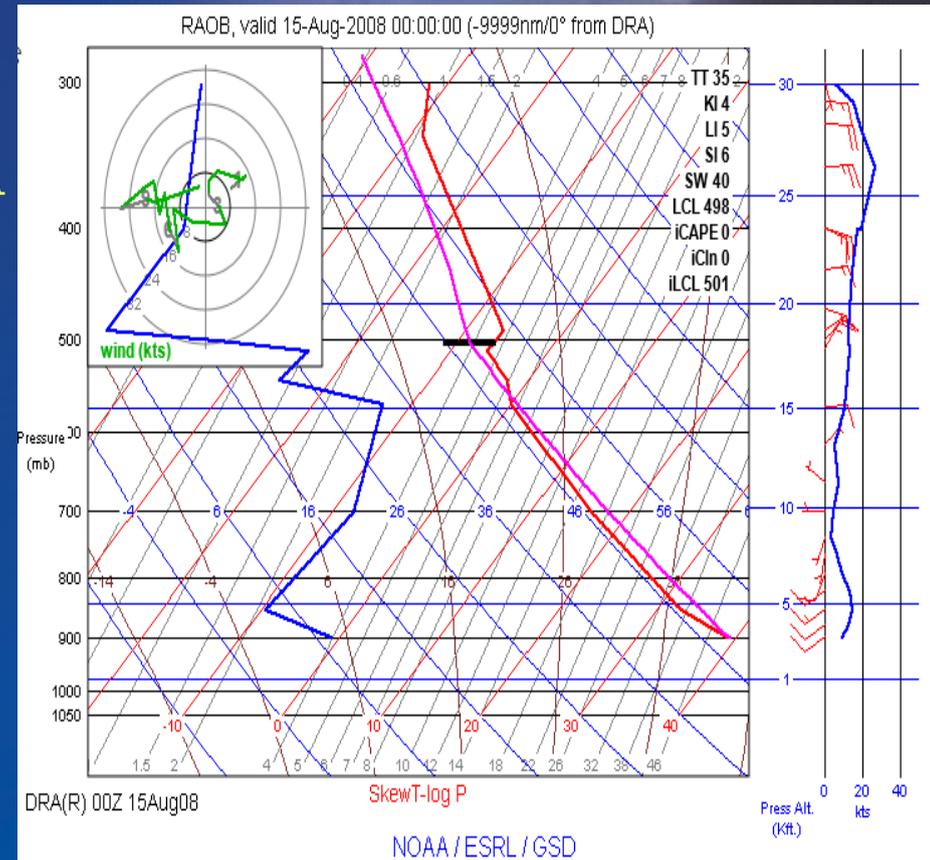
Sounding Visualization Tools

Here's What I Use...

TOOL	EASE OF USE	COST	COMMENTS	PROGRAM ENVIRON
ESRL Interactive Skew-T	Easy to use Fast to Learn	Free	RAOBS, RAP, NAM,GFS Any Lat/Lon or 3-4 letter ID	Browser HTML5
BUFKIT	Moderate Highly interactive once learned	Free	All Operational Models; Only discrete 600+ model sounding points BUFKIT files; Skew-T and Time Series Plots	Visual Basic Windows OS
RAOB.com	Steep Curve; Once learned lots of UI Action; Must be scripted for operational use Dedicated Professional Users	\$100 Basic Soaring Diagram; \$170 Extra for Time Series Graphics	“Kitchen Sink” of Sounding Plots and Analyses; Beautiful Time Series Thermal Plots; Foreground Batch Cmds; RAOBs, Many model formats	Visual Basic Windows OS

ESRL Interactive Skew-T

- My recommendation for ease of use
- Written by Bill Moninger at NOAA Boulder Earth System Research Lab (ESRL) GSD
- Great access to Radiosonde historical obs up to about 8yrs ago
- Originally developed to use Java Plugin - Now uses HTML5 requiring no browser plugin ... works in Ipad



<http://rucsoundings.noaa.gov/gwt/>

ESRL Interactive Skew-T

Choose a sounding

Chose a site, WMOID, or lat,lon: **Desert Rock, NV**

Start date: UTC OR latest

Number of hours to load:

Desired forecast projection:

valid 15-Aug-2008 00:00:00 (-9999nm/0° from DRA)

TT 35
KI 4
LI 5
SI 6
SW 40
LCL 498

NOAA / ESRL / GSD

DRA(R) 00Z 15Aug08

*Walt Rogers 966km Baron
Hilton Triangle - 2008*

**Pick a start date/time...
or just latest model/raob
available**

**You'll get all analyses
instead of forecast if
selected time is in past.
or... all forecasts if
"latest" selected.**

**"forecast projection"
should stay at "shortest"**

ESRL Interactive Skew-T

Choose a sounding

Chose a site, WMOID, or lat,lon:

Start date: UTC OR latest

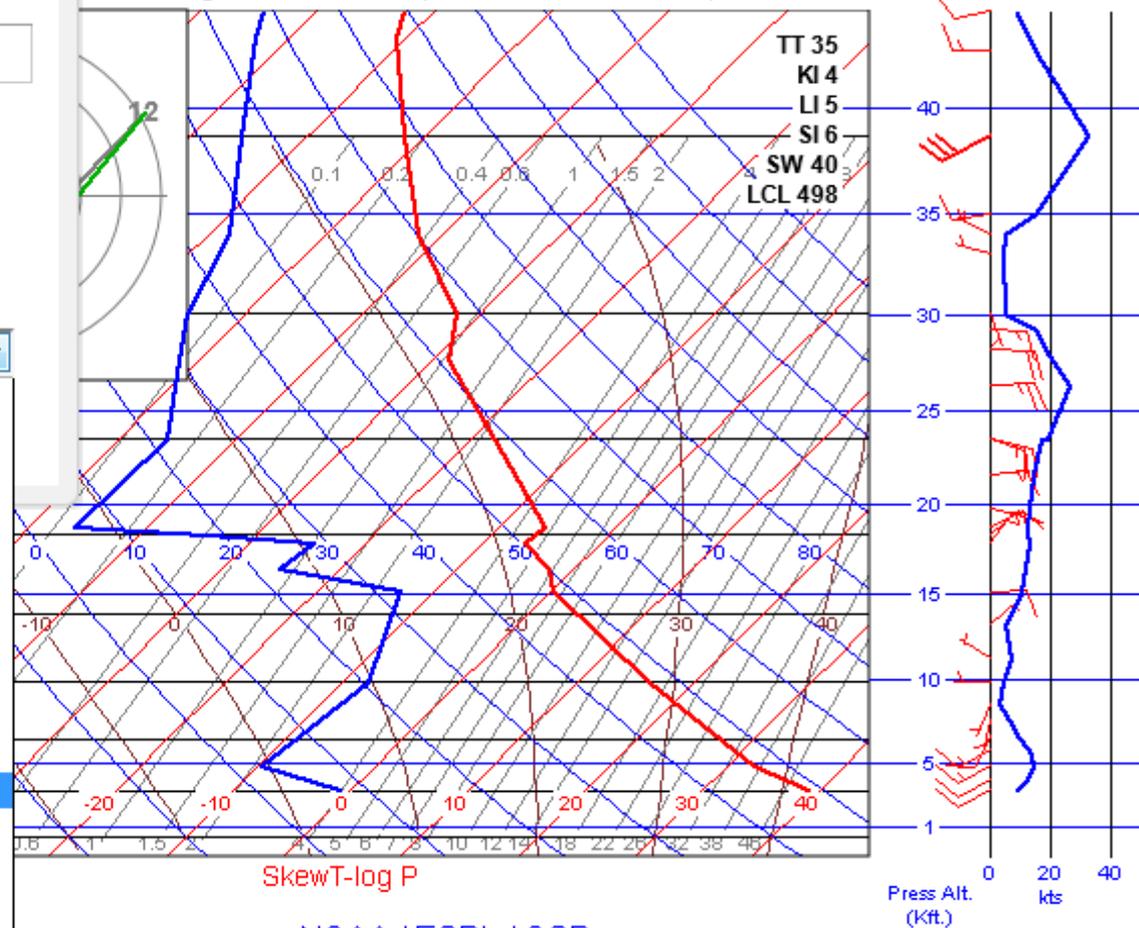
Number of hours to load:

Desired forecast projection:

RAOB (Radiosondes)

- RAP_130 (GSD CONUS 13km)
- RAP_OPS_130 (NCEP CONUS 13km)
- RAP (full RAP domain at RAOB times, else RAP_130)
- Op40 (RAP_OPS_236 CONUS 40km FAST LOAD)
- RAP_221 (GSD RAP entire domain 32 km)
- Bak40 (to 48h. GSD RAP at 40km – formerly 'MAPS')
- Bak13 (RAP archival analyses and 3h forecasts)
- HRRR (3km CONUS)
- FIM (to 5 days)
- GFS (to 5 days)
- NAM (to 15 hrs)
- RAOB (Radiosondes)**
- PROF (Profilers)
- RADIO (Radiometers)
- ACARS (Aircraft-restricted)
- FIM_prs (FIM on isobaric levels)
- RETRO (Special restores)
- for all models check 'latest' to get most recent –
- other runs (if any) are in alphabetical order –

valid 15-Aug-2008 00:00:00 (-9999nm/0° from DRA)



Get text

0.5 mb scale

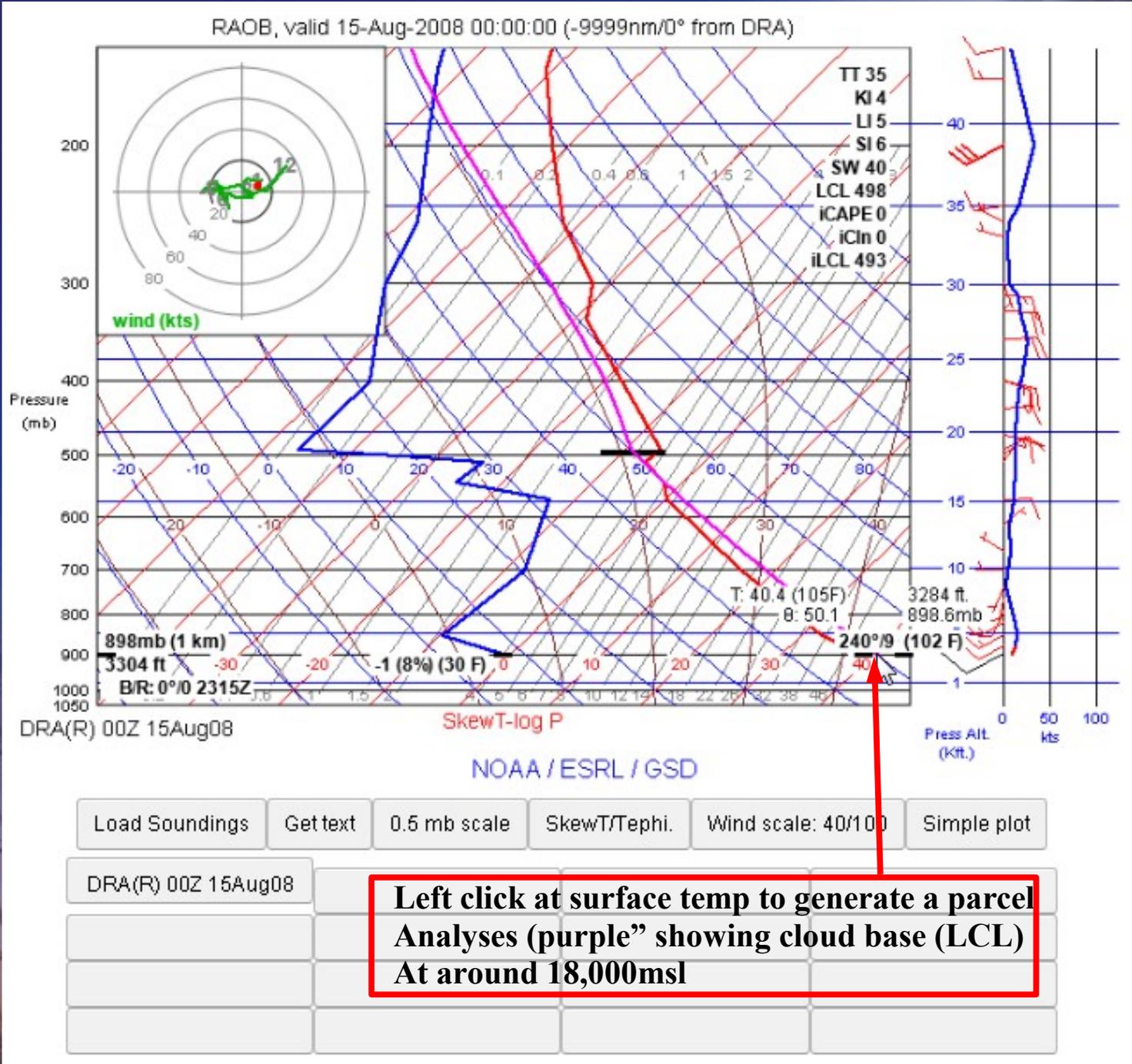
SkewT/Tephi.

Wind scale: 40/100

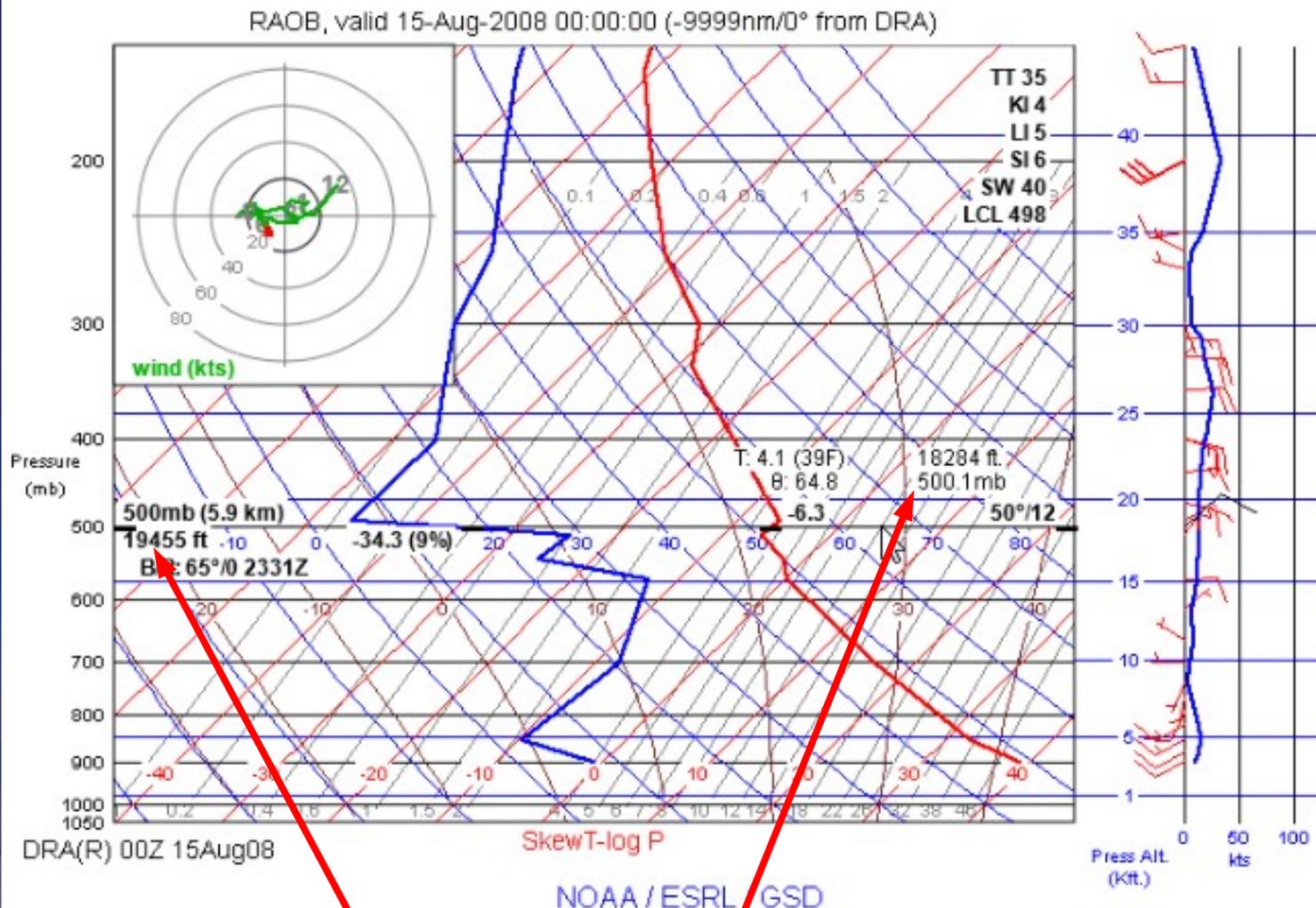
Simple plot

DRA(R) 00Z 15Aug08

ESRL Interactive Skew-T



ESRL Interactive Skew-T



Cursor pointer shows t, p and hgt on diagram along with the model or observed sounding information in bold at the left border. Notice 500mb height is 19455ft on left... and 18284ft on diagram on right. the diagram height is std atmosphere height while the other height is geometric (geopotential) height.





ESRL Interactive Skew-T

- Here's how to interpret sounding data types
- Only two RAP model runs (Exp & Ops - different grids)
- ***Yes it is confusing!***

RAP_130 (GSD CONUS 13km)

RAP_130 (GSD CONUS 13km)

RAP_OPS_130 (NCEP CONUS 13km)

RAP (full RAP domain at RAOB times, else RAP_130)

Op40 (RAP_OPS_236 CONUS 40km FAST LOAD)

RAP_221 (GSD RAP entire domain 32 km)

Bak40 (to 48h. GSD RAP at 40km – formerly 'MAPS')

Bak13 (RAP archival analyses and 3h forecasts)

HRRR (3km CONUS) ← Inop as of early 2016

FIM (to 5 days)

GFS (to 5 days)

NAM (to 15 hrs)

RAOB (Radiosondes) ← Good for raobs back 8yrs

PROF (Profilers)

RADIO (Radiometers)

ACARS (Aircraft-restricted)

FIM_prs (FIM on isobaric levels)

RETRO (Special restores)

– for all models check 'latest' to get most recent –

– other runs (if any) are in alphabetical order –

**RAP OPS means NWS Operational Model
RAP GSD or BAK means experimental RAP
Run at ESRL NOAA Boulder**

**RAP_130 GSD – 13km grid version –
slow access displaying data. Experimental
Version**

**RAP_OPS_130 - 13km grid version -
Slow access displaying data. Operational
Version**

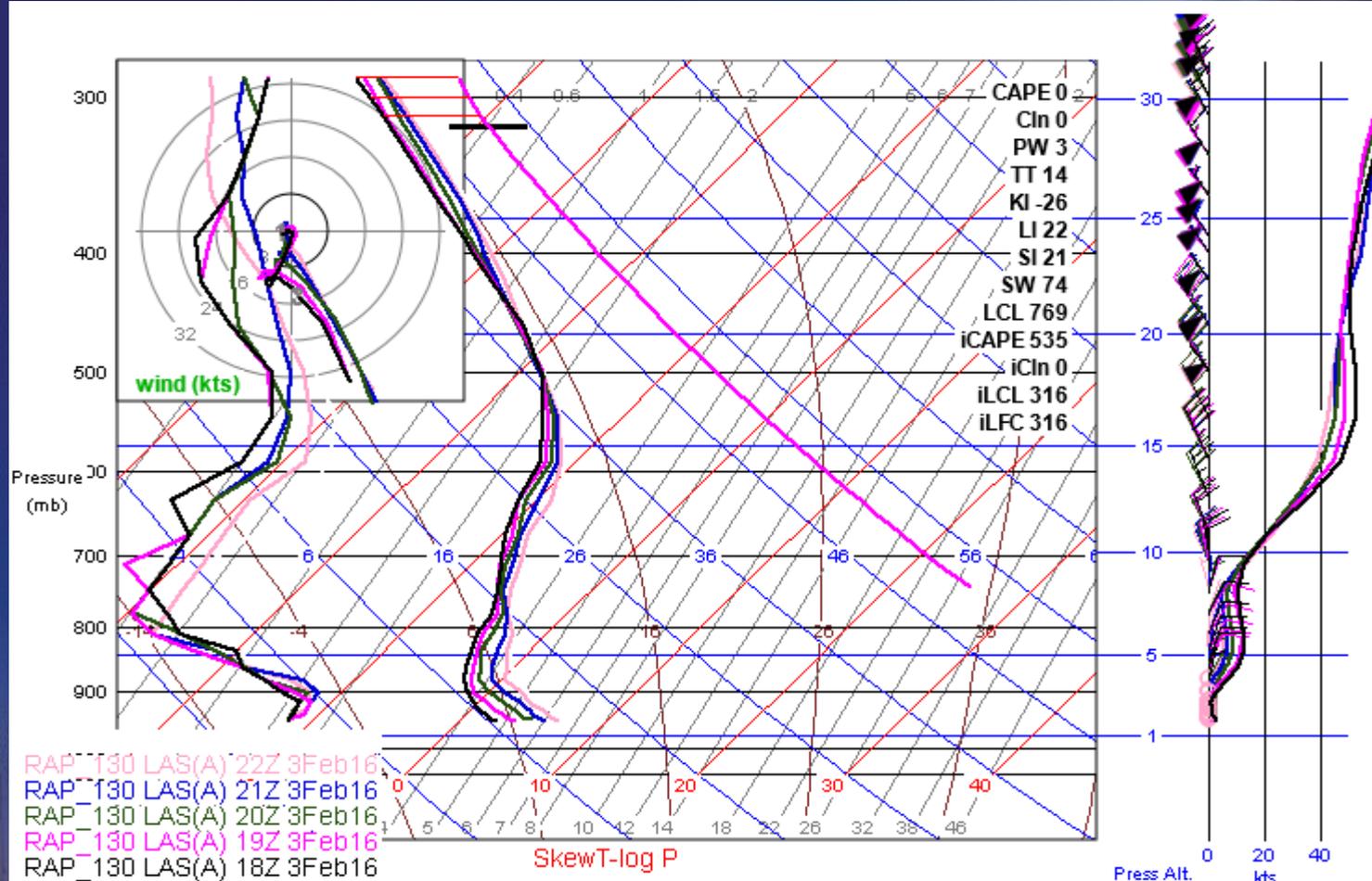
**Bak40 – 40km grid version RAP
Experimental. Display access fast**

**Op40 - 40km grid version RAP. Operational
Version. Display access fast**

**RAP_221 – 32km grid version Experimental
About same as RAP_130**

***For fast access use OP40 or BAK40 RAP...
Slower access higher resolution use
RAP_OPS_130 or RAP_130 GSD***

ESRL Interactive Skew-T



NOAA / ESRL / GSD

Load Soundings	Get text	150mb scale	SkewT/Tephi.	Wind scale: 40/100	Simple plot
LAS(A) 23Z 3Feb16	LAS(A) 22Z 3Feb16	LAS(A) 21Z 3Feb16	LAS(A) 20Z 3Feb16		
LAS(A) 19Z 3Feb16	LAS(A) 18Z 3Feb16				



ESRL Interactive Skew-T

- Select the "Instructions" link for more documentation
- To find 3-4 letter IDs that work... select METARs link to browse for a city or airport name that will work in the locations field
- These 2 minute mp4 videos below shows interactive use of the ESRL NOAA Skew-T

Video Demo Skew-T RAOB -

Web Access: bit.ly/1Sc60mn

Local File

Video Demo Skew-T RAP -

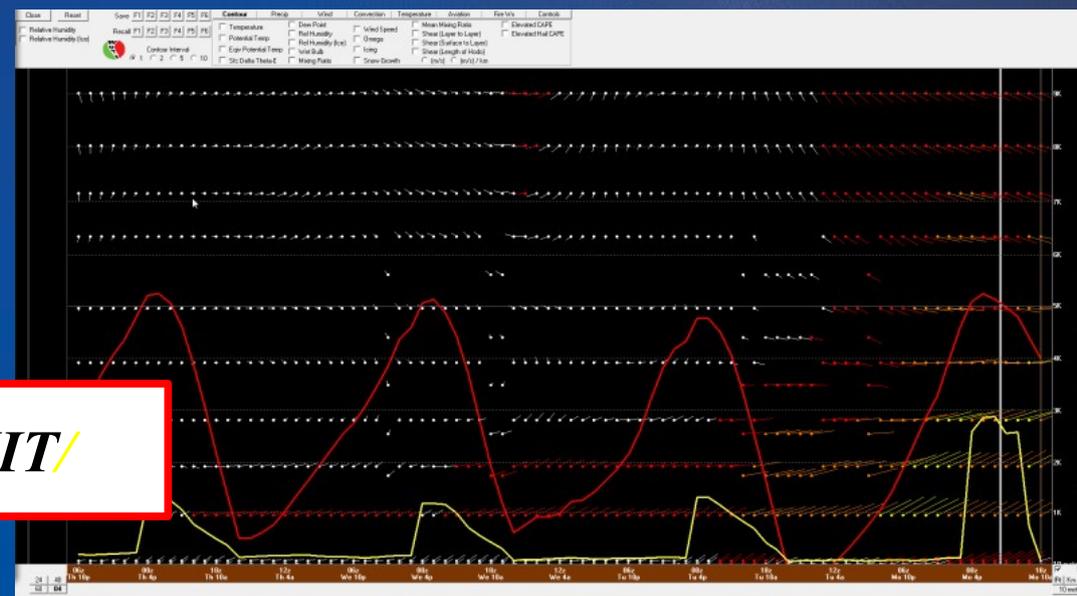
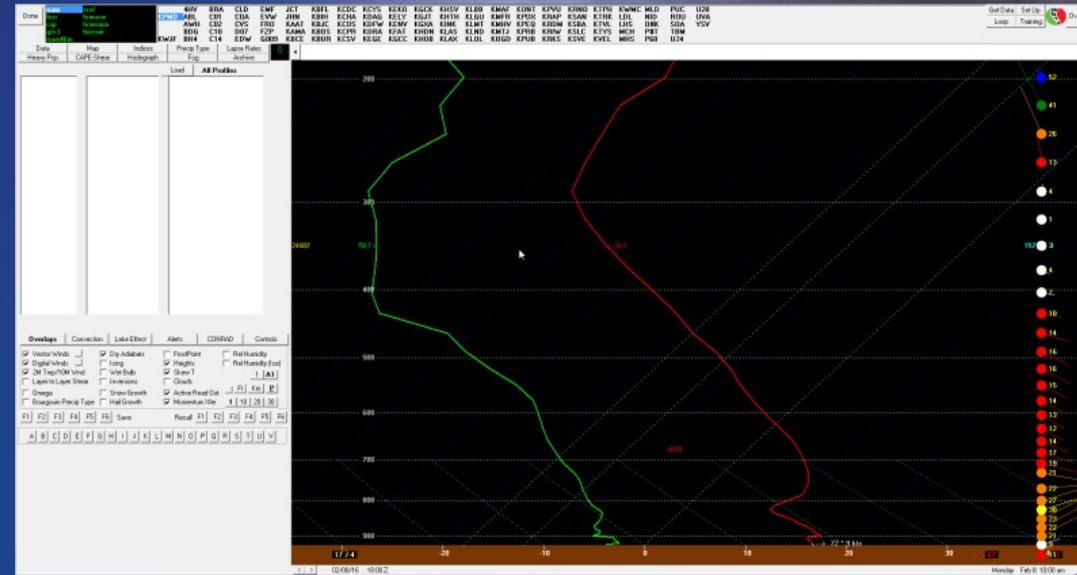
Web Access: bit.ly/1PxGhPm

Local File



BUFKIT Sounding Viewer

- High resolution model soundings
NAM, RAP, HRRR, GFS, NAM4KM
- Two Windows - PROFILE view
and OVERVIEW Time Series
cross section. Browse Skew-T
interactively
- Uses specially encoded model
sounding binary (BUFR) files -
decoded into BUFKIT text
format... 600+ discrete locations
- Easily browse through 15hr
(HRRR) to 180hr (GFS) time
series
- Mixed Layer (thermal) Height; T,
Td, RH, Winds, Precip



<http://www.wdtb.noaa.gov/tools/BUFKIT/>



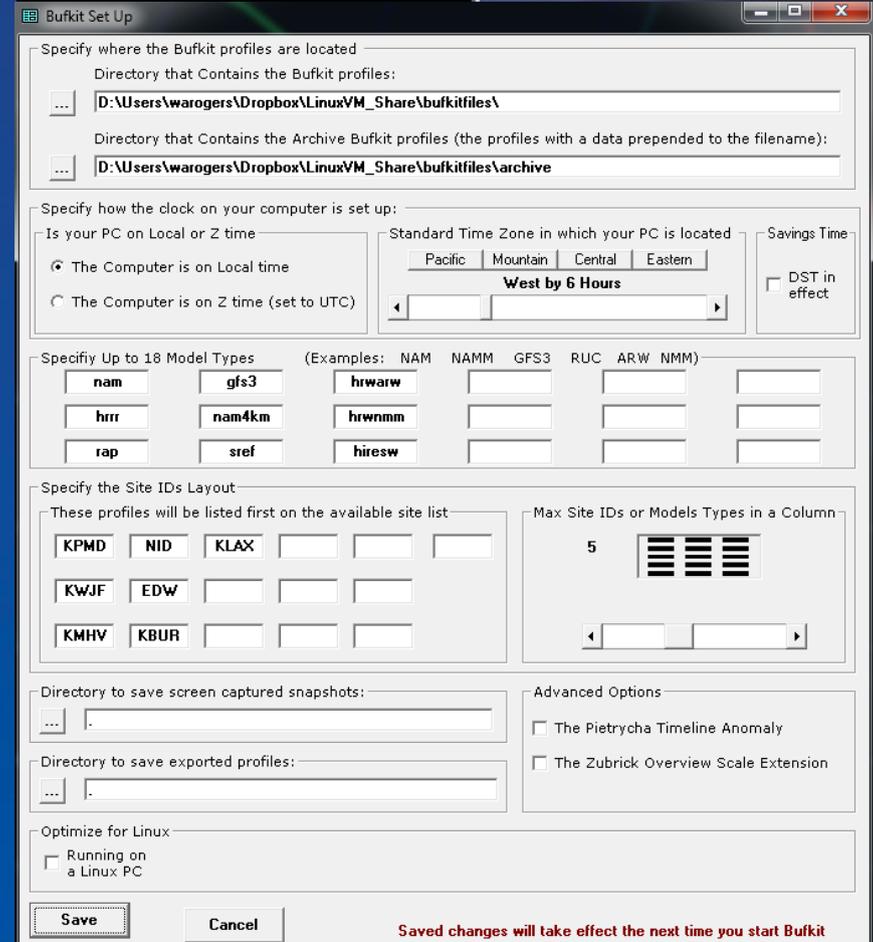
BUFKIT Sounding Viewer

Getting Started

- Program freely available - Visual Basic (need Windows to run)
- Settings - Set download directory
- GetData - Download BUFKIT files with BufGet app
- Training - Lots of Help Videos
- PROFILE is main Skew-T Window
- OVERVIEW opens 2nd Window... best if you have two monitors



Upper Right Corner





BUFKIT

Five-Minute University

Buf Forecast Profile ToolKit Version 15.11.2 The Warning Decision Training Division



Bufkit 11

Bufkit 10

Getting Started With Bufkit

Bufkit 9 Introduction	Requirements	Configuring Bufkit	Running Under Linux
Getting Data	Using Bufget	Bufkit Profile Sites	

Profile Knobology

The Profile Screen Layout	Selecting a Model and Profile	Zoom In and Out	Display Options
Convective Options	The Map Display	Using Nomograms	My Favorite Layouts



BUFKIT Sounding Viewer

Getting Data

- Penn State has most reliable BUFKIT data
- Click on dot to manually DL file
- ..Or.. capture URL into BufGet which allows scripting to DL many at once
- Bufgruven - Perl script fetches & converts to BUFKIT - Linux.. run in a VM - Advantage of capturing earlier model runs

PENN STATE

Bufkit Data Distribution System

www.meteo.psu.edu/bufkit/CONUS_NAM_18.html

strc.comet.ucar.edu/software/bgruven/

CONUS
Northeast U.S.
Southeast U.S.
Northcentral U.S.
Southcentral U.S.
Northwest U.S.
Southwest U.S.
Alaska
Hawaii
Canada
Central America
Domain

00Z NAM
06Z NAM
12Z NAM
18Z NAM

00Z NAM4KM
06Z NAM4KM
12Z NAM4KM
18Z NAM4KM

00Z GFS
06Z GFS
12Z GFS
18Z GFS

03Z SREF
09Z SREF
15Z SREF
21Z SREF

00Z RAP
01Z RAP
02Z RAP
03Z RAP
04Z RAP
05Z RAP
06Z RAP
07Z RAP
08Z RAP
09Z RAP
10Z RAP
11Z RAP
12Z RAP
13Z RAP



BUFKIT Sounding Viewer OVERVIEW

Close Reset Save F1 F2 F3 F4 F5 F6 Contour Precip Wind Convection Temperature Aviation Fire Wx Controls

Relative Humidity
 Relative Humidity (Ice)

Recall F1 F2 F3 F4 F5 F6

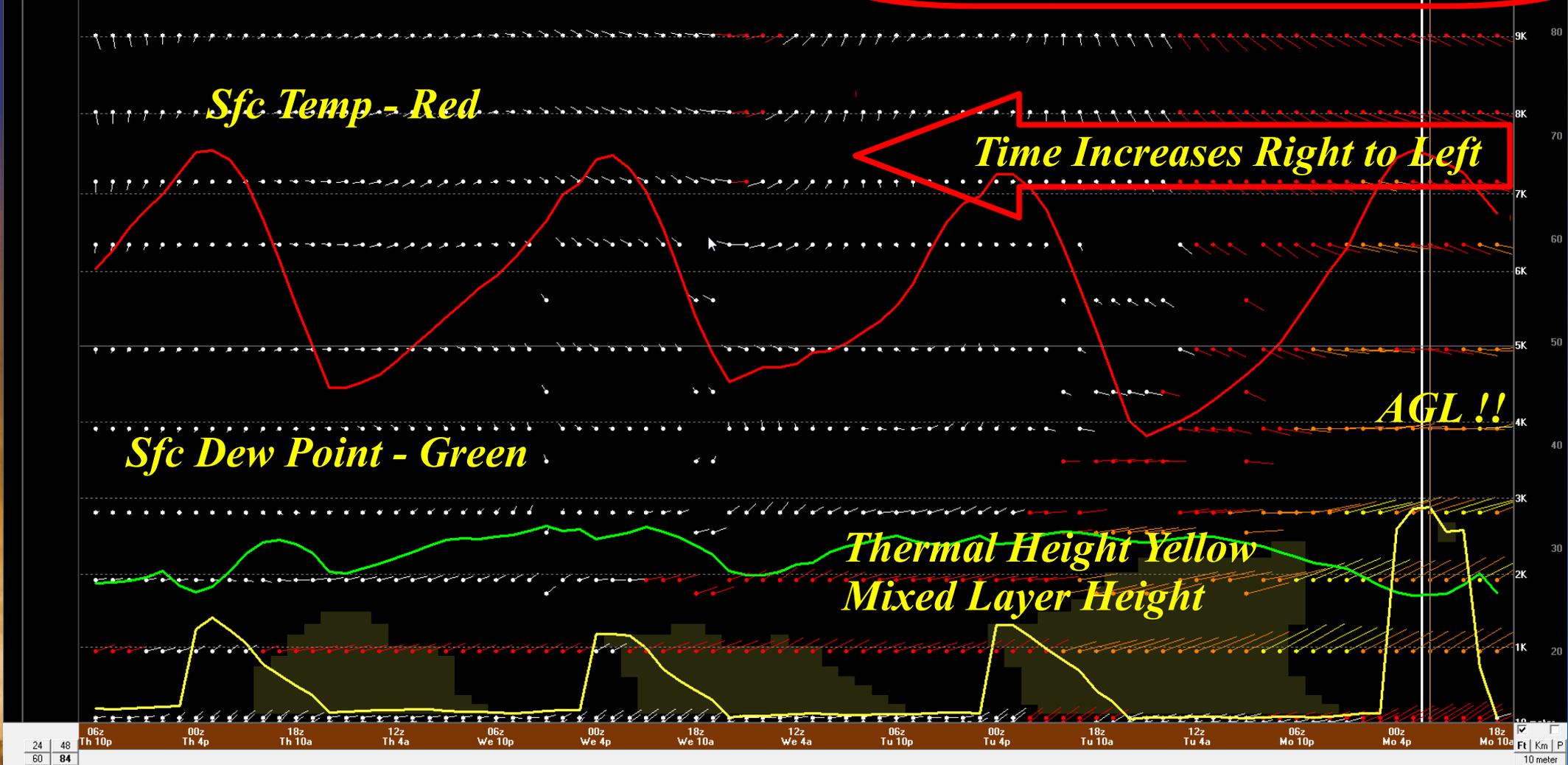
Contour Interval 1 2 5 10

Sigma Wind VWP 1 A2 Color

Wind Speed (kts) 10 20 30 40 50 60

VVel Mean Wind

Under TABs: WIND - Colorize arrows for speed; FIRWX - Check "Mixing Height"; TEMP - Select Temp and Dewpoint

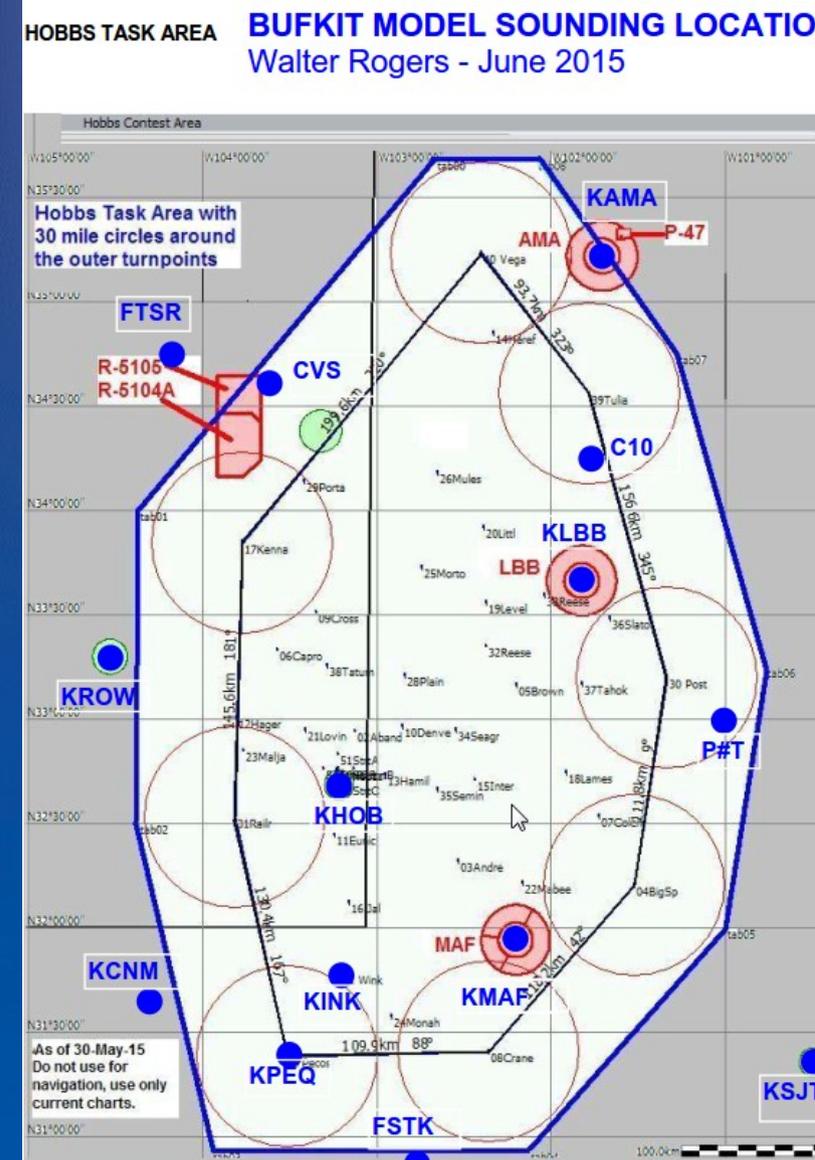




BUFKIT Sounding Viewer

Summary

- Really a Great Program! ... for Quickly browsing model soundings...
 - Thermal Heights
 - Wind, Temp and Dew point
 - RH Cross Sections
 - Checking for Surface Winds affecting Runway Configuration
- Limitations
 - You can only use one of the 600+ sites
 - You cannot script it for automatic generation of graphics
 - Thermal Heights are in AGL... requires mentally converting to MSL
 - Two step process.. first get soundings .. then view





BUFKIT Sounding Viewer *Summary*

Check out these Video Demos:

BUFKIT PROFILE:

bit.ly/1TReY80

Local File

BUFKIT TIME SERIES:

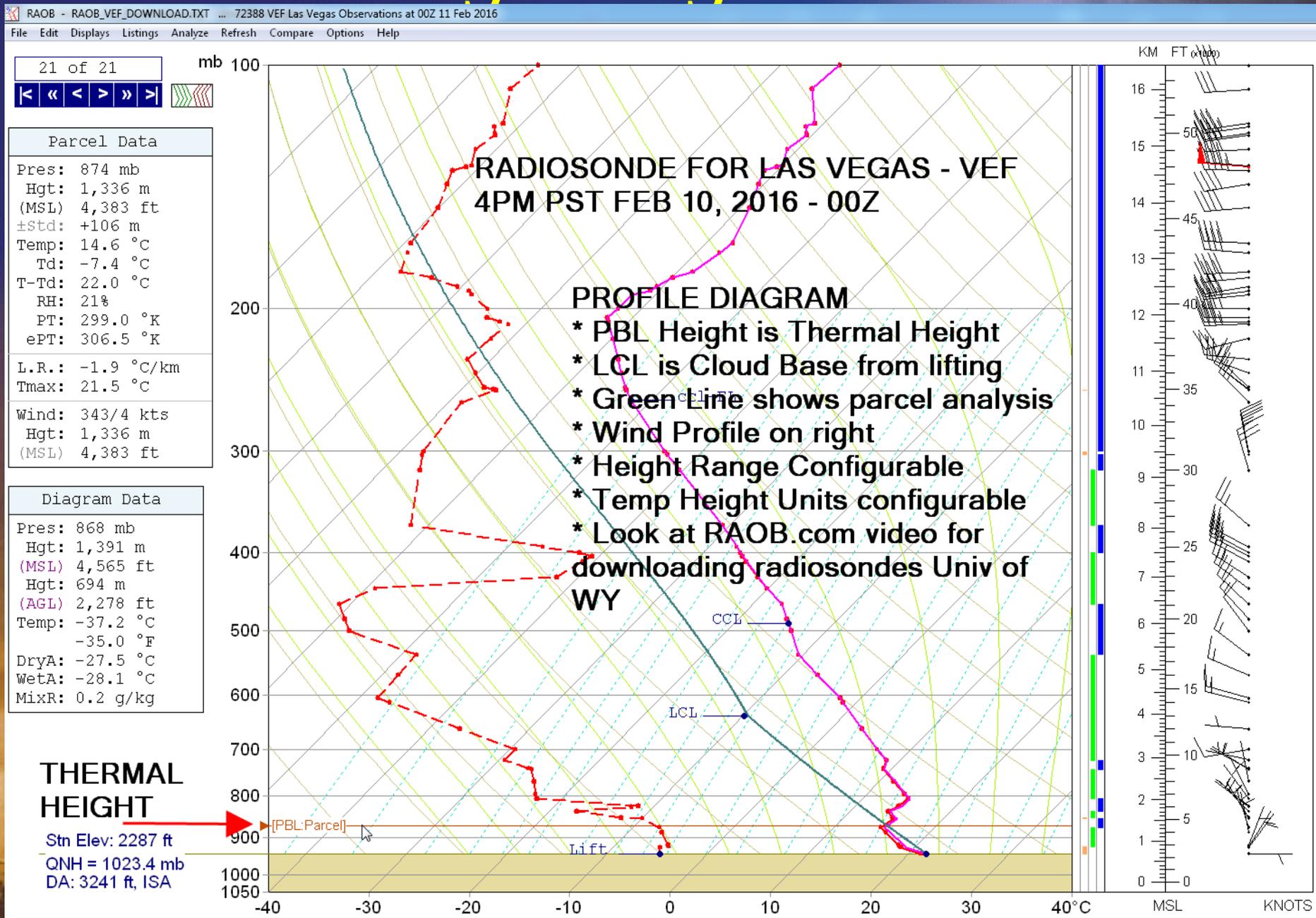
bit.ly/1Q82zNt

Local File





Sounding Diagram Window





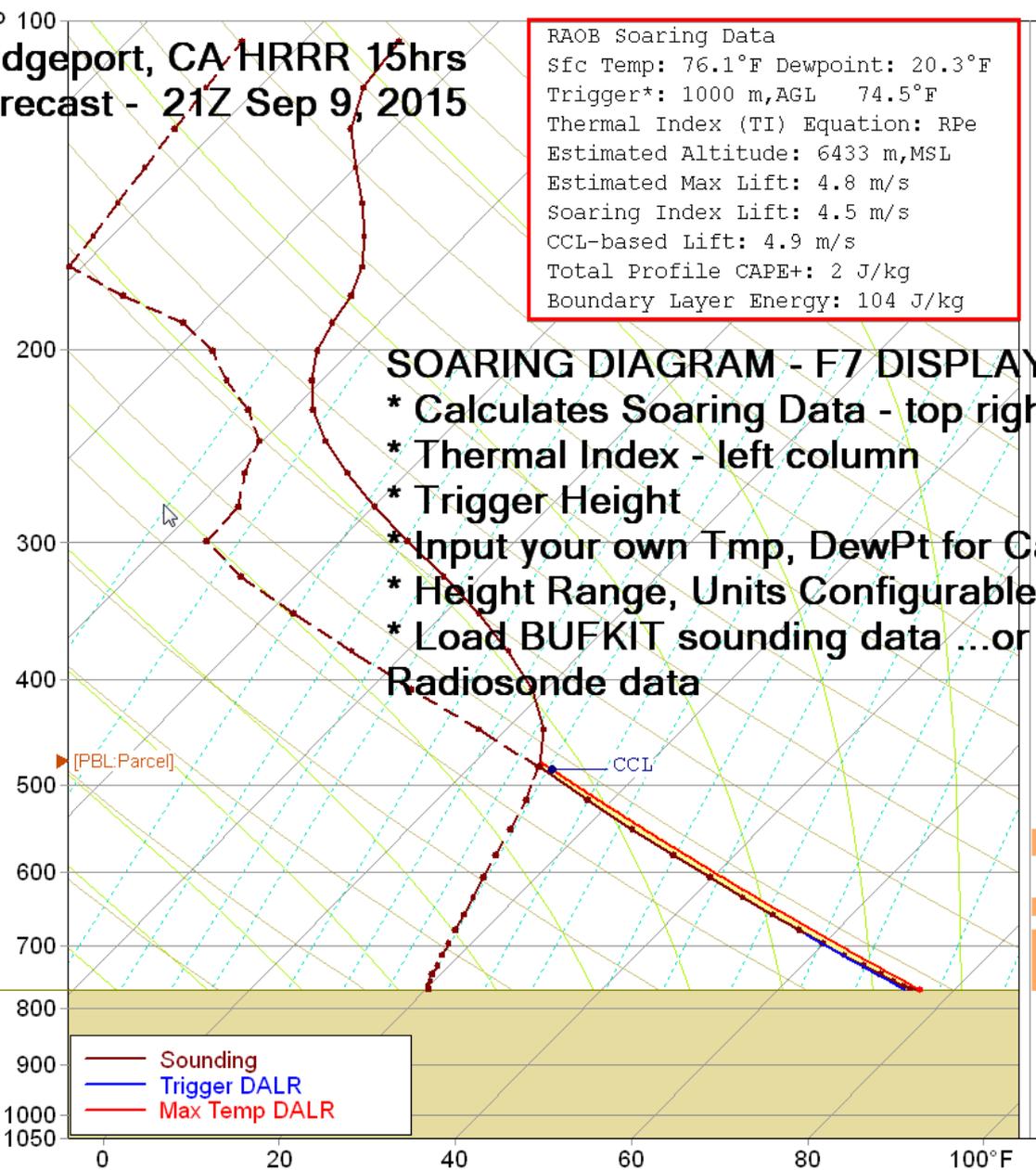
Soaring Diagram Window

RAOB - HRRR_BDG.BUF ... 45 TIM - BDG - 04 DTG: 2015-09-12 21:00:00
 File Edit Displays Listings Analyze Refresh Compare Options Help

Height m,MSL	TI °C	Trigger °F
11800	14.4	113.2
11600	13.5	110.6
11400	12.8	108.6
11200	12.3	106.9
11000	11.8	105.5
10800	11.5	104.4
10600	11.1	103.4
10400	10.9	102.5
10200	10.6	101.6
10000	10.4	101.0
9800	10.2	100.4
9600	10.1	99.8
9400	9.9	99.2
9200	9.7	98.6
9000	9.5	97.9
8800	9.3	97.2
8600	9.0	96.5
8400	8.6	95.4
8200	8.2	94.3
8000	7.7	93.1
7800	7.1	91.7
7600	6.5	90.3
7400	5.9	88.8
7200	5.0	86.8
7000	4.1	84.8
6800	3.2	82.8
6600	2.0	80.2
6400	0.8	77.6
6200	-0.5	75.0
6000	-0.6	74.9
5800	-0.6	74.8
5600	-0.7	74.7
5400	-0.7	74.6
5200	-0.8	74.6
5000	-0.8	74.6
4800	-0.8	74.6
4600	-0.8	74.6
4400	-0.8	74.5
4200	-0.8	74.5
4000	-0.9	74.5
3800	-0.8	74.5
3600	-0.8	74.5
3400	-0.8	74.5
3200	-0.8	74.5
3000	-0.8	74.6
2800	-0.8	74.7
2600	-0.7	74.8
2400	-0.4	75.4
2380	0.0	76.1

Bridgeport, CA HRRR 15hrs
 Forecast - 21Z Sep 9, 2015

RAOB Soaring Data
 Sfc Temp: 76.1°F Dewpoint: 20.3°F
 Trigger*: 1000 m,AGL 74.5°F
 Thermal Index (TI) Equation: RPe
 Estimated Altitude: 6433 m,MSL
 Estimated Max Lift: 4.8 m/s
 Soaring Index Lift: 4.5 m/s
 CCL-based Lift: 4.9 m/s
 Total Profile CAPE+: 2 J/kg
 Boundary Layer Energy: 104 J/kg



- SOARING DIAGRAM - F7 DISPLAY**
- * Calculates Soaring Data - top right
 - * Thermal Index - left column
 - * Trigger Height
 - * Input your own Tmp, DewPt for Calcs
 - * Height Range, Units Configurable
 - * Load BUFKIT sounding data ...or Radiosonde data

KM FT (x1000)

Soaring ...

Surface Temperatures
 20.3 °F 76.1

Dewpoint Air-Temp

Trigger Height
 999 Meters, AGL

Equations
 Russell Pearson (RPe)
 Mario Piccagli (MPi)
 RPe & MPi Average

Calculate Print Graph
 Diagram Save Image
 Clouds Clipboard
 CCL Help
 Refresh Video

Stn Elev: 2380 m
 QNH = 1025.6 mb
 DA: 3127 m, ISA

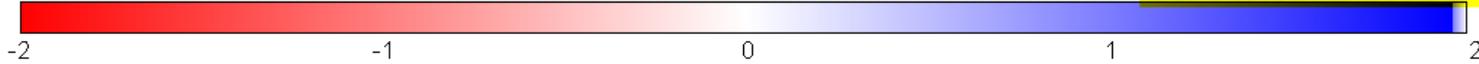


Time Series Thermal Plot

TI Time Series Graphic

HGT
Kft MSL
Kt x 1000

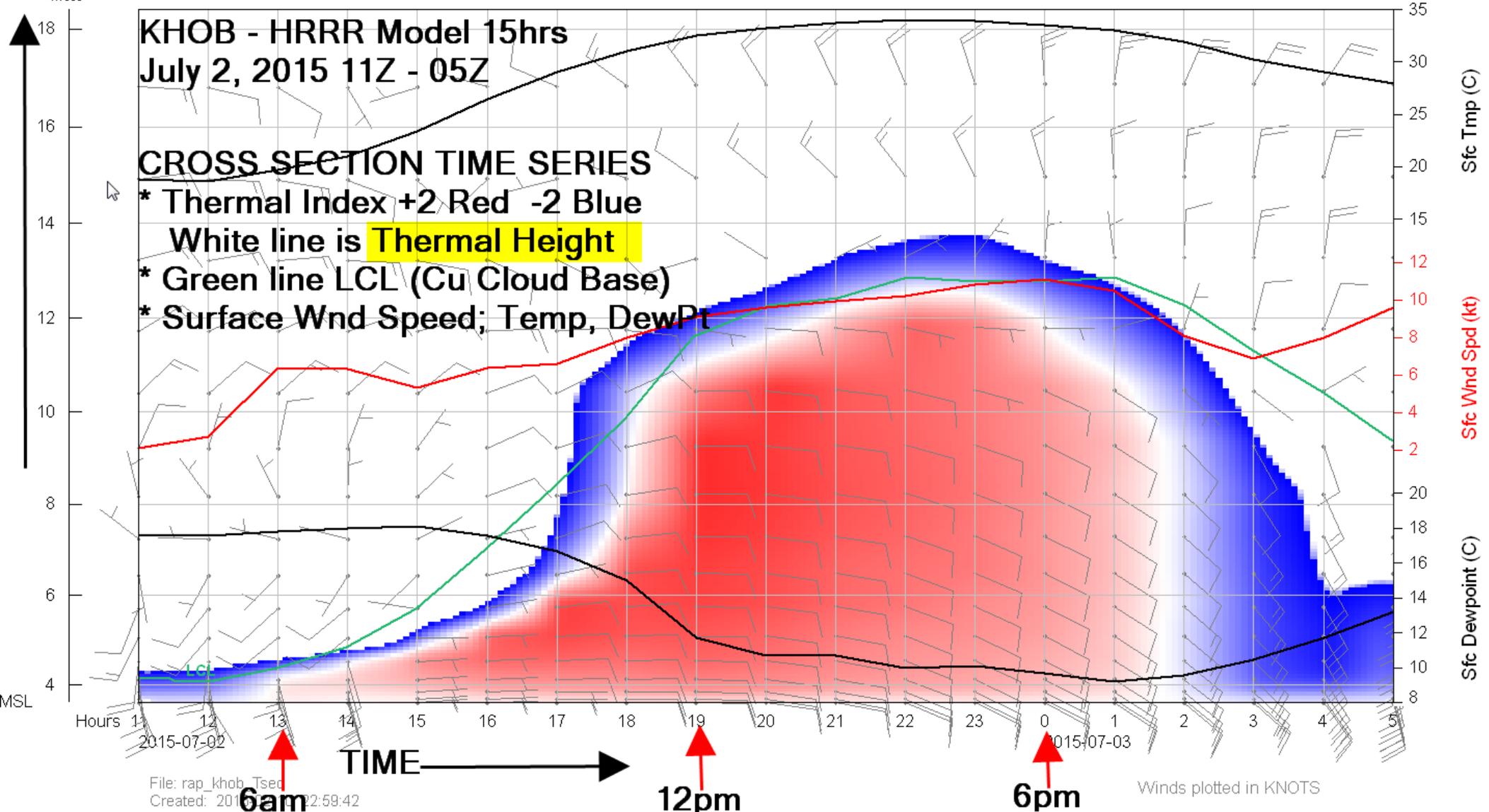
Thermal Index (°C)



KHOB - HRRR Model 15hrs
July 2, 2015 11Z - 05Z

CROSS SECTION TIME SERIES

- * Thermal Index +2 Red -2 Blue
- White line is Thermal Height
- * Green line LCL (Cu Cloud Base)
- * Surface Wnd Speed; Temp, DewPt



File: rap_khob_Tsced
Created: 2015-07-02 12:59:42

6am

12pm

6pm

Winds plotted in KNOTS



Time Series Thermal Plot

RAOB_TimeSection_nam_bdg.txt

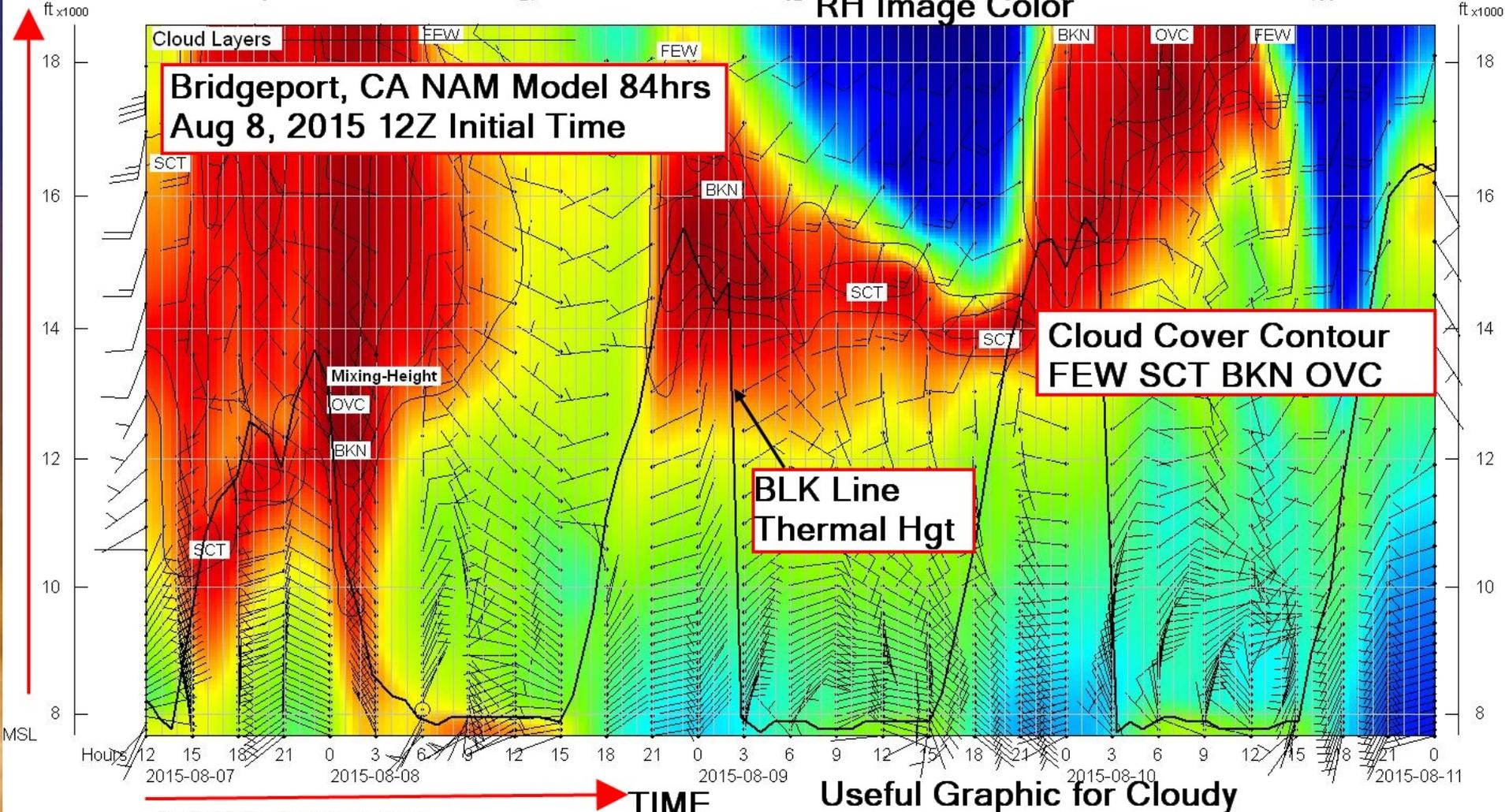
RH Time Series

Relative Humidity {RH/w} (%)

HGT KMSL



RH Image Color



Bridgeport, CA NAM Model 84hrs
Aug 8, 2015 12Z Initial Time

Cloud Cover Contour
FEW SCT BKN OVC

BLK Line
Thermal Hgt

File: RAOB_TimeSection_nam_bdg.txt
Created: 2015-08-07 12:44:55

Useful Graphic for Cloudy
Soaring Days



RAOB.com Summary

- Analyzing individual profiles is too time consuming using PROFILE DIAGRAM ... or SOARING DIAGRAM
- My preferred method is to use Time Series Graphics
 - RAOB allows 1-8 configuration profiles for each graphic type
 - Batch Commands ... a RAOB feature ... greatly speeds up the graphic creation
 - By using a custom bash script, I can generate 20 or 30 graphics from a command line selecting model type, station name and Config number for graphic (TI or RH)

There are numerous training videos on RAOB.com to get you started. Here's one video demo I've created that shows creation steps for: Sounding Screen and Time Series Graphics Scripted

RAOB has a Steep Learning Curve! It's for the PROFESSIONAL SOARING FORECASTERS \$\$\$:) Not the casual user!



Where Is U.S. NOAA Numerical Modeling Efforts Headed?

- These are Operational Models for Soaring Community... HRRR (3km), RAP (13km), NAM (13km) and GFS (0.25Deg)
- Currently for NWS Operational Community... Already have HIRSW (3km), NAM CONUS NEST (4km)
- Soon... there will be an Hourly Updated NAMRR (4km) ... for NAM Rapid Refresh
- Plans for Future... ALL REGIONAL MODELS MOVING TO ENSEMBLES - Sometime in 2018. Parallel “members” or model runs
 - SREF -12km; 24-84 hr forecasts - hourly for short range
 - HREF - 3km; 24 hr forecast - periodically 36-60hrs
- Legacy Models “Deterministic” RAP, HRRR, NAM and NAMRR will be “sunset” somewhere in 2019
- Improved Boundary Layer physics... Land Surface Models ... Initialization - probably most helpful to soaring community



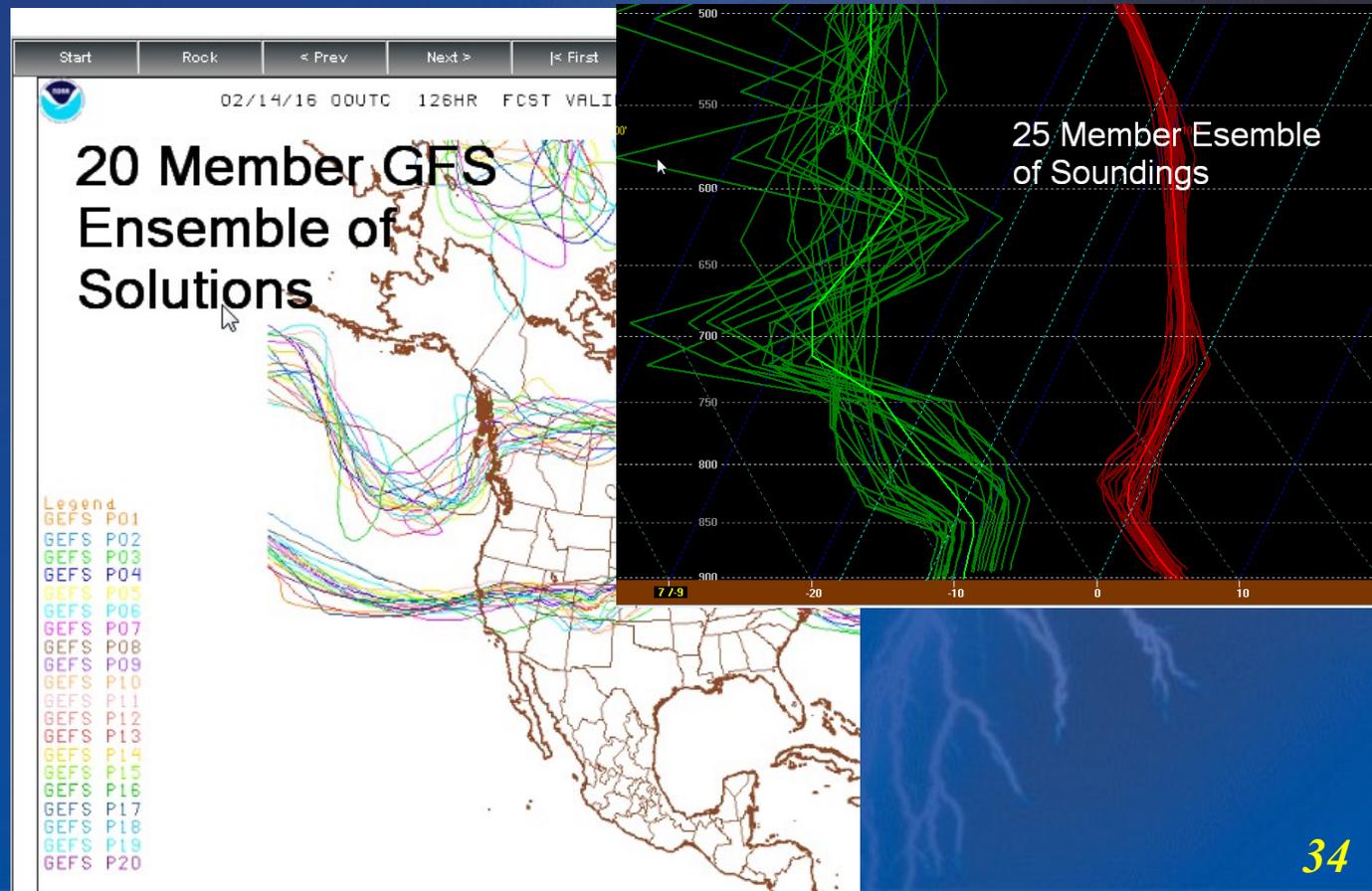
What are ENSEMBLES? And What Does This Mean for Us?

A set of different forecasts all valid at the same forecast time(s). The differences between the forecasts can provide information on the probability distribution of the predicted variables. The forecasts in the ensemble may have different initial conditions, boundary conditions, parameter settings, or may even be from entirely independent NWP models.

For Soaring this means we'll see "probability" Of given parameters

- * Thermal Height*
- * Thermal Strength*
- * Thunderstorm to occur*
- * Given Thunderstorm strength*

XCSkies and DrJack will have to be updated





Weather In The Cockpit

Data Sources, Availability and Modeling

These are what I think are important...

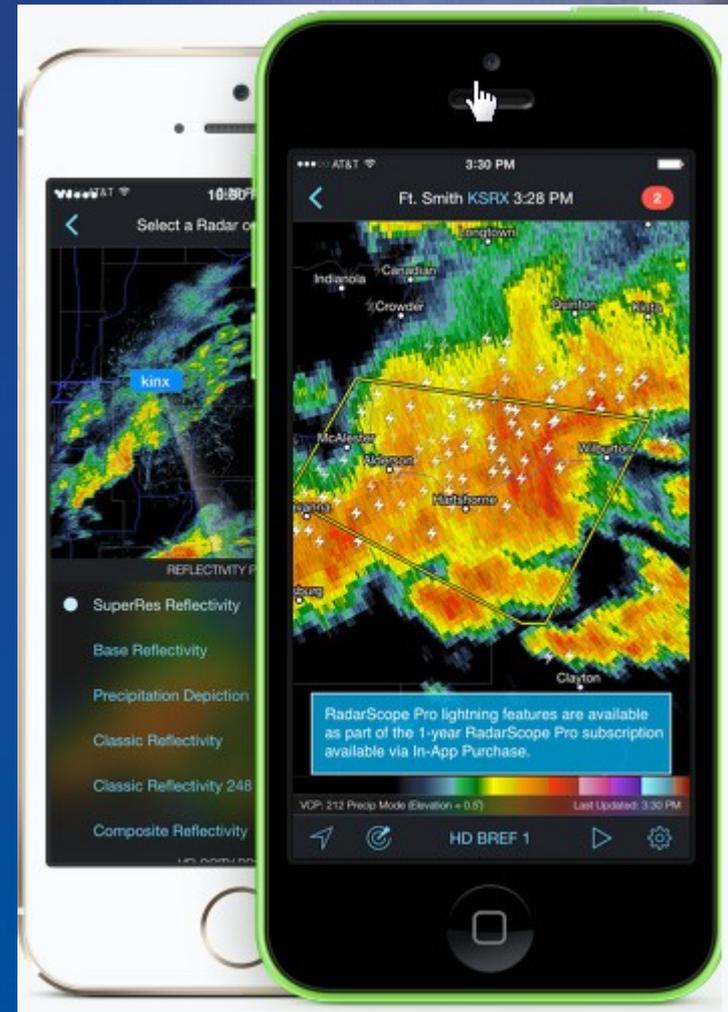
- NEXRAD Radar – RADAR SCOPE – Raw Data High Resolution (Iphone/Ipad Android Commercial App)
 - Shows finest detail clear air mode, outflow boundaries, convective cells and convergence lines
- GOES-R – New Family of geo-stationary weather satellites
 - 5 minute (optionally 1min) updates versus 15min
 - 0.5km Resolution versus 1km for Visible
 - Many more infrared, visible channels and lightning mapper
- IDV (Integrated Data Viewer) – Great Program for 2D/3D visualization of Modeling Data, Radar, Satellite and Any Kinds of Point Data
 - A Tool for Researchers or Professional Forecaster Looking to Create Custom Soaring Graphics
 - Great at geo-referencing all data sets... including contest airspace



Weather In The Cockpit

RadarScope - A PDA App

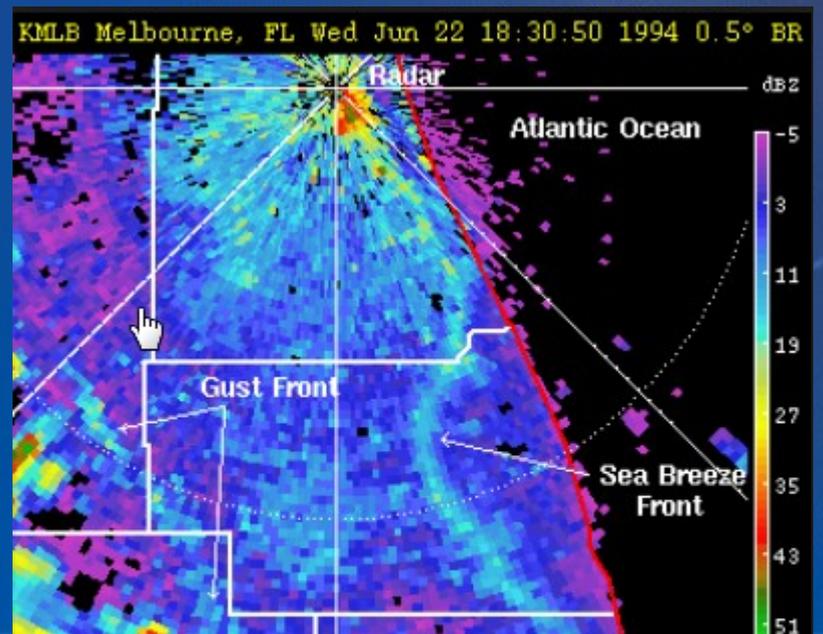
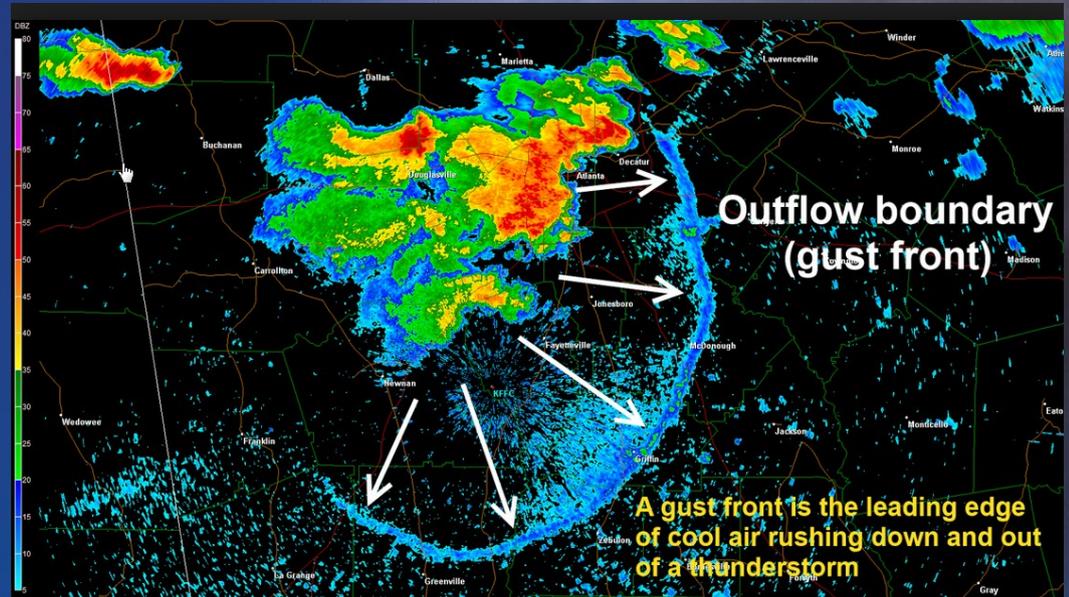
- NEXRAD U.S. Radar Network
- Professional fine detail access
- No smoothed images...native radar data rendered in its original radial format for a high level of detail
- Very fast processing - low latency. <1 minute
- All official NEXRAD products, Echo Top, super res, all elev angles, precip types, etc
- PRO VERSION - \$10/yr adds
 - Lightning
 - 20 frame super res animation
- IOS Android - \$10 initial purchase



Weather In The Cockpit

What's So Special About RADARSCOPE?

- Low Latency High Res Data!
- You can see clear air outflow boundaries, sea breeze front ... and sometimes shear lines
- Precip hydrometeor types including hail
- Lightning data animation... not very common on other PDA radar apps
- Shows NWS warning polygons
- Great tool for after landing... Decide on "boxing it up"



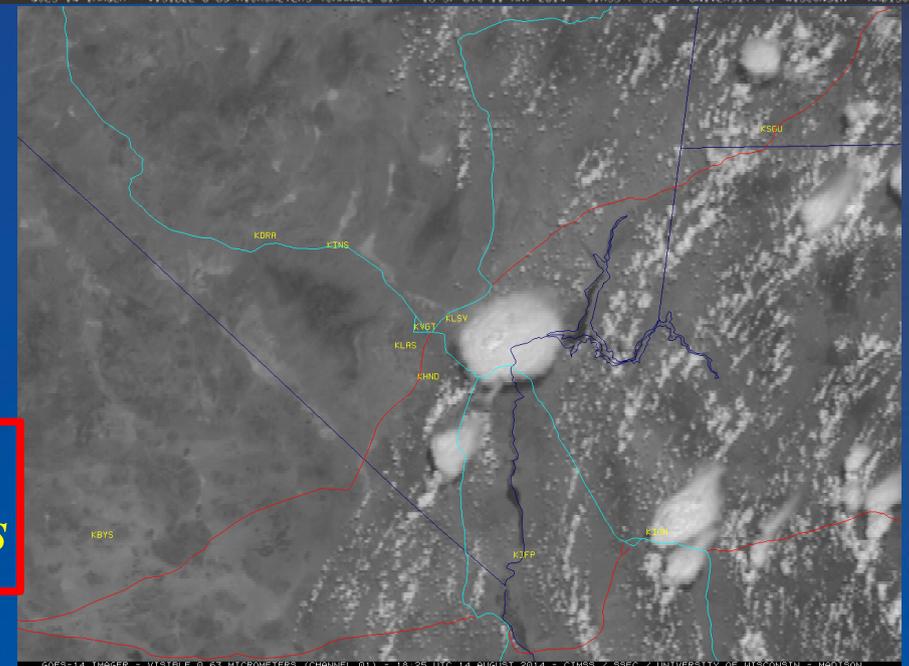
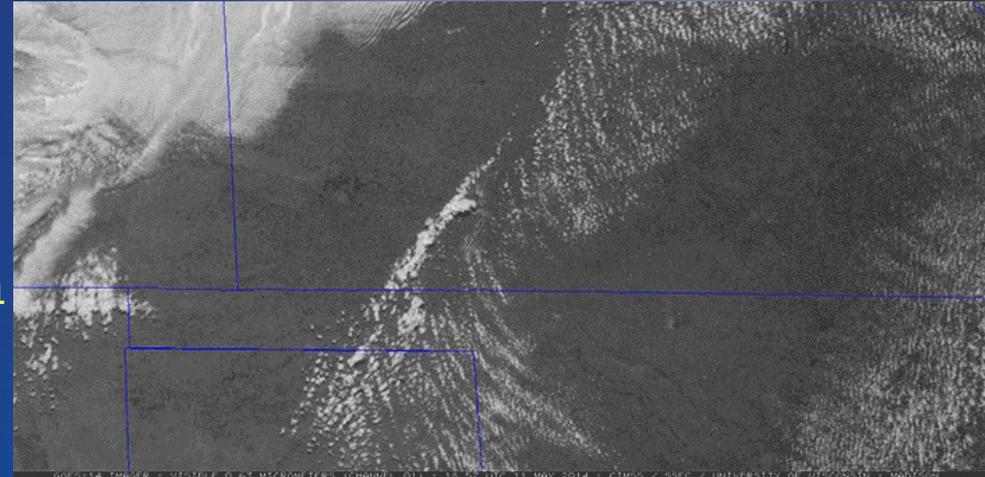
In my opinion, RADARSCOPE is the best PDA app for gliding. It holds promise for "In the Cockpit Use" ... especially if they Add GOES-R 5minute 0.5km imagery!

Weather In The Cockpit

GOES-R Higher Res Imagery

- **Next Generation NOAA Geo-Stationary Satellite with Advanced Imager**
- **Twice line resolution vis - 0.5km**
- **Three times update rate - 5min vs 15min currently**
- **More Infrared channels**
- **Much improved sensitivity dynamic range**
- **Lightning Mapper**
- **Launches March 2016 - Operational in 2017**

Great Tool for tracking isolated cu and low Coverage cloud cover marking cloud streets





Weather In The Cockpit

IDV 2D 3D Viewer

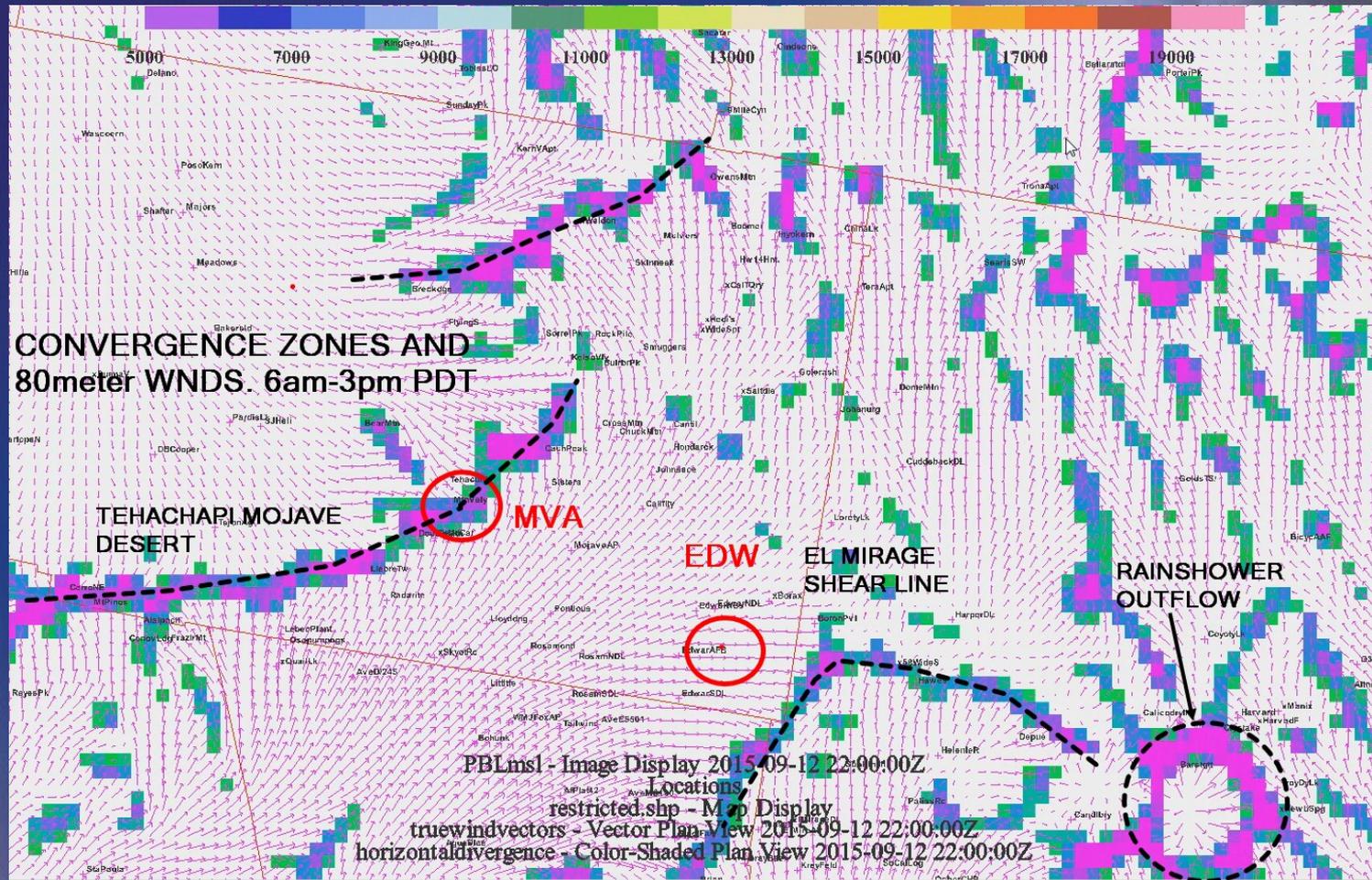
- Integrated Data Viewer (IDV) visualizing and analyzing atmosphere & geosciences
- Free supported software (Java any platform)
- interactively slice, dice, and probe the data to create cross-sections, profiles, animations and value read-outs of multi-dimensional data sets
- ***You don't have to do DL gigabyte sized data sets to see High Res Model Data!***
- Can customize model calculations to PBL, Convergence Zones, MW Lift for soaring graphics
- Could be used as a server to generate “Cockpit Weather” for gliding



Avenal – Central California Shear Lines moving into San Joaquin Valley. HRRR model hourly data 3-7pm PDT 09/10/2015

Weather In The Cockpit

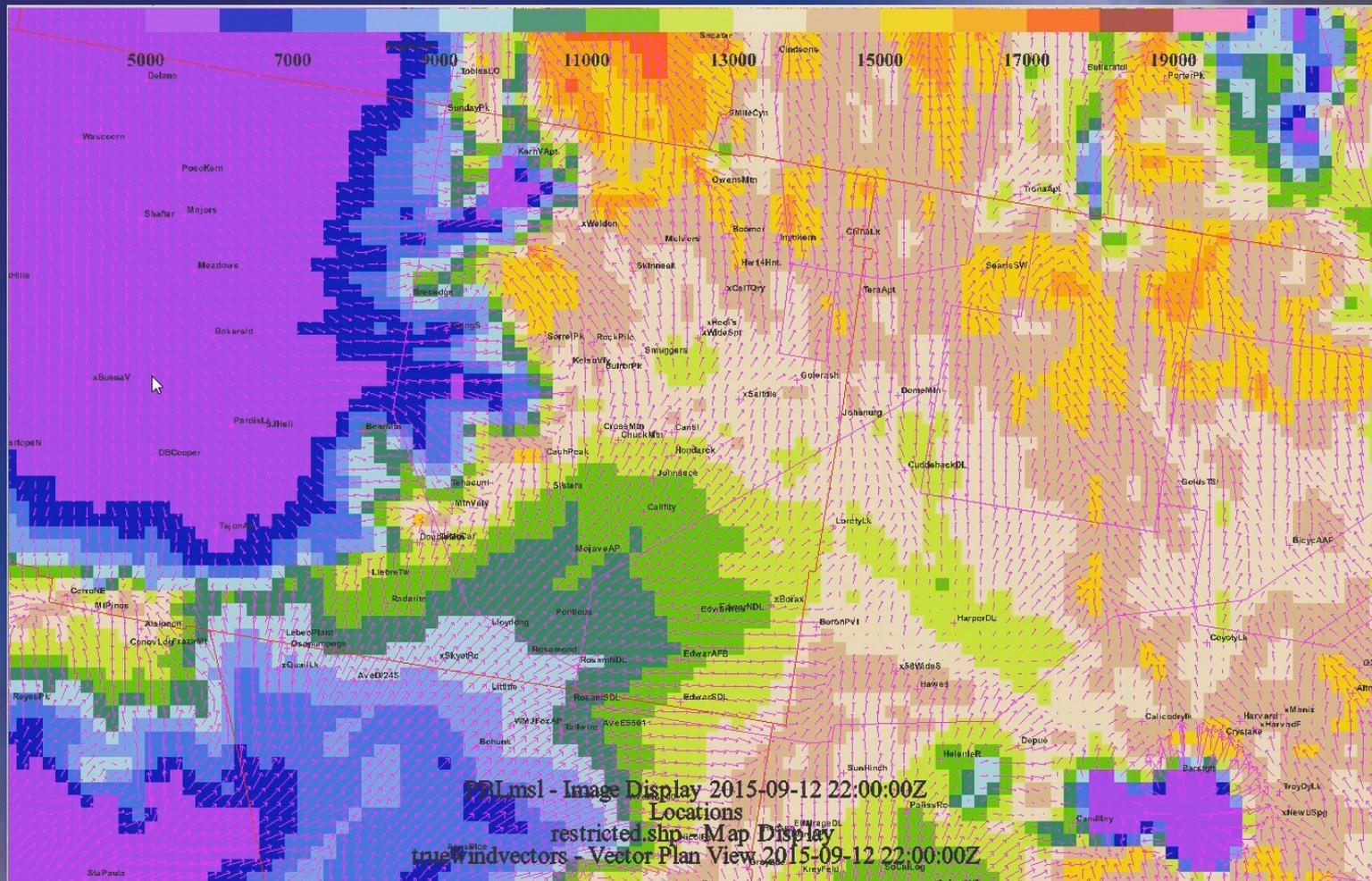
HRRR Model Shear Lines



HRRR Model Convergence zones based on 80m AGL winds at 3km resolution. IDV allows view of finest details on model forecasts.

Weather In The Cockpit

HRRR Model Thermal Height



HRRR Thermal Height – Top Color Bar 1000s ft MSL. Creation of CU cloud cover with colored base level is also available from IDV.



Weather In The Cockpit

- **If... *The Big If*...** Cockpit Displays can integrate high res radar, satellite... maybe rapid update model data ... **Then...** in some (probably small) cases, weather-in-cockpit data would give a significant competitive edge for flight decisions
 - High Bandwidth Internet needs to be available
 - Cockpit big screen displays need to integrate data... data formats different in different parts of the world
 - There's no way that this WON'T be distracting...
 - Mitigation for safety and fairness...
 - Two Place Gliders? Open Class Gliders? Rely on ground Weather Dispatcher to Relay info verbally or via low bandwidth graphics?
 - Contest Rules Prohibit Devices in Cockpit
 - Going to be an Open Source - non-profitable project. Probably only attempted by "**Techno Nerds**"... unless there is overlap with a commercially available product ... like RADARSCOPE for PDAs



Weather In The Cockpit

My Take on this...

- Allow Weather in the cockpit – You can't really prevent it especially when PDA Phones and Tablets are so prevalent
 - Not because it will transform racing... instead it will bring on innovation
 - Technology nerds will equip... but their “heads will be down” too much... impacting competitiveness
 - Allow ground flight dispatcher/weather “team flying”... this might add a significant boost to the “social aspects” of the sport.
 - This “Team Flying” approach to competition will better prepare U.S. pilots for World Competitions
 - Gary Itner will still probably “whip our xxx” anyway regardless of how we equip :)



The End... Spectacular Soaring!

Thank you...

*Walter Rogers
wrogerswx@gmail.com*

*Posted Presentation:
Ssa.org → Member Resources
→ Weather → News
→ Tutorials*





Request for Met Assistant

Nephi 2016 Nats

- I will be flying the Standard Class Nats in my Discus 2A “WX”
- and... also doing contest weather support with briefings
- I am looking for someone interested and committed to assist me with preparing briefings in real-time... and learning the “software tools” and/or techniques of soaring forecasts
- You must be able and willing to work with me well before hand so as to coordinate the tasks at hand
- You do not have to be at Nephi... we can collaborate remotely
- Good computer skills necessary... and strong interest needed
- Available daily during contest for 1-2 hours at a fixed time early to assist in preparation

Contact me at: wrogerswx@gmail.com

If interested...